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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,382	11/25/2003	Gordon Munns	3165.41USU1	8003

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EXAMINER	
WARREN, MATTHEW E	

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 03/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/723,382	MUNNS, GORDON	
	Examiner	Art Unit	
	Matthew E. Warren	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 16-30* is/are rejected.

7)☒ Claim(s) *10-15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/1/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the Preliminary Amendment filed on June 10, 2004.

Claim Objections

Claims 22 and 29 are objected to because of the following informalities: the claims include the limitation of the "one layer of GaN being about 0.4 thick" but do not disclose which unit of measurement is desired. The other claims disclose either Angstroms or microns. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-9 and 16-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Udagawa et al. (US 6,462,361 B1) in view of Flynn et al. (US Pub. 2003/0178633 A1).

In re claims 1, 17, and 24, Udagawa et al. shows (figs. 5 and 6) a device comprising: a substrate (801) a buffer region (802) positioned upon said substrate, wherein said buffer region comprises an upper buffer region (802b) and a lower buffer region (802b) (see col. 14, lines 34-54 for explanation of upper and lower buffer regions); a heterojunction region (803-806) positioned upon said buffer region; and a

superlattice (802a) positioned between said lower buffer region and said upper buffer region, and wherein said device is configured to function as a heterojunction field effect transistor (col. 1, lines 15-21). Udagawa et al. shows all of the elements of the claims except the superlattice comprising alternating layers of GaN and $Al_xGa_{1-x}N$. Flynn et al. shows (fig. 3) a heterojunction transistor comprising a superlattice structure having layers of GaN and $Al_xGa_{1-x}N$. Flynn explains that Group III/V nitride semiconductor materials are useful in FETS because of their high thermal conductivities and large electrical breakdowns [0004-0005]. The invention employs GaN and AlGaN materials to improve electron mobility and enhance device reliability and device performance. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the superlattice structure of Udagawa by substituting the material layers with GaN and AlGaN as taught by Flynn to improve electron mobility and enhance device reliability and device performance.

Also in re claims 16, 17, and 24, Flynn additionally discloses [0072] that the substrate may comprise, sapphire, SiC, or other suitable substrate materials (such as silicon, which is well known as a substrate material).

In re claims 2, 3, 18, and 25, Flynn discloses [0021] that x is from about 0.01 to 0.40.

In re claims 4, 5, 19, 20, 26, and 27, Udagawa discloses (col. 13, lines 50-67) that the superlattice comprises the range of 2-500 individual layers.

In re claims 6 and 7, neither reference discloses the thickness of the upper and lower buffer layers, however it would have been obvious to one of ordinary skill in the

art to make the thickness of the buffer layers within the desired range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller, 105 USPQ 233.*

In re claim 8, Udagawa discloses (col. 13, lines 50-67) that the layers of the superlattice are about 10 nm (100 Angstroms), which is between 5 and 200 Angstroms thick.

In re claim 9, Udagawa shows (fig. 6) that the heterojunction region comprises a first and second layer (803 and 804), wherein the second layer is positioned directly above the buffer and the first layer is positioned directly above the second layer.

In re claims 21, 22, 28 and 29 as far as understood, Flynn discloses [0072-0073] that a buffer layer comprises AlN and GaN. The AlN layer is about 400 Angstroms thick, which is within the same order as 300 Angstroms.

In re claims 23 and 30, neither reference specifically discloses the desired thickness of the GaN and AlGaN layers, however it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the GaN and AlGaN of any desired thickness, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Allowable Subject Matter

Claims 10-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Weeks, Jr. et al. (US Pub 2004/0119067 A1) and Hayashi et al. (US 6,534,791 B1) also disclose other heterojunction devices having superlattices and nitride semiconductor materials.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thur and alternating Fri 9:00-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEW
February 28, 2005

TOM THOMAS
SUPERVISORY PATENT EXAMINER